PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU SOIL EXPLORATION REPORT

WAIKELE, EWA, OAHU, HAWAII

To:
COMMUNITY PLANNING, INCORPORATED

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

MARCH 2, 1972

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S. 2" O.D. THIN WALL TUBE; 2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. ____ of ____
Driller: W. LUM ASSOC. INC. Date: DEC. 18, 1971
Field Party: GLORY, IKAIKU
Type of Boring: AUGER (MOBILE B-30) Diam.: 4"
Elev.: 114'± * Datum: —
Drill Bit: T.C. DRAG
Water Level: NOT NOTICED
Time: —
Date: 12-18-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 114'± *?	0									
	1" A.C.										
	BROWN, SILTY CLAY W/SAND & CORAL FRAGMENTS		2"SS	1-A	-	24	-	-	-		
(ML)	STIFF REDDISH BROWN CLAYEY SILT	5									
(ML)	STIFF, BROWN CLAYEY SILT		2"S	1-B	-	29	-	12050	-		10/.5' 10/.2'
	BOULDER										
	DRILL RATE: 7'-9.5' - 1 HR	10									
(MH)	STIFF, REDDISH BROWN & GRAY CLAYEY SILT		2"SS	1-C	-	31	-	-	-		
		15	2"S	1-D	-	35	-	4130	-		14/.5'
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT										
		20	2"SS	1-E	-	27	-	-	-		50/.4' HAMMER BOUNCES
	BROWN & GRAY DECOMPOSED ROCK										
		25	2"SS	1-F		NO	RECOVERY				50/.0' HAMMER BOUNCES
	DRILL RATE: 25'-28' = 2 MIN. 28'-30' = 3 MIN.										
		30	2"SS	1-G		NO	RECOVERY				50/.1' HAMMER BOUNCES
	DRILL RATE: 30'-35' - 1 HR. 40 MIN.										
		35	2"SS	1-H	-	22	-	-	-		21/.5' 50/.3' HAMMER BOUNCES
	ORANGE & BROWN SILTY SAND (DEC. ROCK)										
		40	2"SS	1-I	-	36 44 25	-	-	-		30/.5' 30/.3' HAMMER BOUNCES
	MOTTLED BROWN DECOMPOSED ROCK										
	END OF BORING @ 41.3'										

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971.

WAIPAHU BRIDGE

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

BORING NO. 2 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date DEC. 17, 1971

Field Party GLORY, KAKU

Type of Boring AUGER (MOBILE B-30) Diam. 4"

Elev. 114' ± * Datum —

Drill Bit T.C. DRAG

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" SS 2" STANDARD SPLIT SPOON
2" S 2" O.D. THIN WALL TUBE

Water Level					
Time	—				
Date	12-17-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 114' ± *?	0									
(MH)	1" A.C. BROWN, SILTY CLAY W/SAND & CORAL FRAGMENTS		2"SS	2-A	-	24	-	-	-		
(MH)	STIFF, REDDISH BROWN SILTY CLAY W/TRACES OF ASH	5	2"S	2-B	-	27	-	7920	-		3/.5' 6/.5'
(MH)	MEDIUM, REDDISH BROWN CLAYEY SILT	10	2.5S	2-C	-	30	-	-	-		
(MH)	STIFF BROWN CLAYEY SILT	15	2"S	2-D	-	28	-	5300	-		7/.5' 7/.5'
(MH)	MEDIUM, REDDISH BROWN W/TRACES OF BROWN SILTY CLAY										
	COBBLE OR BOULDER	20	2"SS	2-E	-	36	-	-	-		20/.5' 50/.4' HAMMER BOUNCES
	MOTTLED GRAY DECOMPOSED ROCK	25	2"SS	2-F	-	32	-	-	-		50/.5'
		30	2"SS	2-G	-	19	-	-	-		50/.5'
	END OF BORING @ 30.5'										

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971

1-9-72 RM

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 3 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date DEC. 22 & 27, 1971

Field Party GLORY, COLLURA

Type of Boring AUGER (MOBILE B-30) Diam. 4"

Elev. 112'± * Datum —

Drill Bit FINGER TYPE

Water Level				
Time	—			
Date	12-27-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 112'± *2	0							
ML	STIFF, REDDISH BROWN CLAYEY SILT	5	3-A	31	28	44	—	—	
	BROWN, CLAYEY SILT	10	3-B	—	29	—	—	—	
MH	STIFF, REDDISH BROWN CLAYEY SILT	15	3-C	34	33	51	—	—	
	DENSE, MOTTLED BROWN SILTY SAND (DECOMPOSED ROCK)	20	3-D	—	36	—	—	—	30/.5' 40/.2' HAMMER BOUNCES
		25	3-E	—	30	—	—	—	40/.2' HAMMER BOUNCES
	GRAY DECOMPOSED ROCK	30	3-F	—	19	—	—	—	50/.1' HAMMER BOUNCES
	DECOMPOSED ROCK OR BOULDER	35	3-G	—	17	—	—	—	50/.4' HAMMER BOUNCES
	END OF BORING @ 40.1'	40	3-H	—	13	—	—	—	50/.1'

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
EZRA KOIKE
WALLACE WAKAHIRO
2030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

March 2, 1972

MR. GEORGE HOUGHTAILING
Community Planning, Inc.
700 Bishop Street, Suite 608
Honolulu, Hawaii 96813

Dear Mr. Houghtailing:

Subject: Proposed Overpass Structure
Over Haul Cane Road in Waipahu
Soil Exploration Report
(for foundation design purposes)
Waikele, Ewa, Oahu, Hawaii

In accordance with your request, eight borings were made for foundation design purposes for the Proposed Overpass Structure Over Haul Cane Road in Waipahu, Waikele, Ewa, Oahu, Hawaii.

FIELD EXPLORATION AND LABORATORY TESTS

Borings were made with 4-in. diameter augers using clay, carbide drag, finger type, or roller rock bits. Rotary corings were made with carbide coring bits.

Soil samples were recovered with 2-in. diameter thin-wall tubes and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches. Rock samples were recovered with a "BX" double tube core barrel.

GENERAL SITE CONDITIONS

The proposed overpass structure site is located on about a 5 to 20% slope of a natural drainageway. The ground slopes down toward the west from about 5 to 16% grade with variations in localized areas.

The site is planted with sugar cane and crossed with irrigation ditches.

INTERPRETATION OF SOIL CONDITIONS

The soils at the site may be generally described as follows:

> Stiff reddish-brown clayey silts and silty clays ("ML," "CL" soils) to about 8 to 20-ft depths, underlain by decomposed rock to about 25 to 50 ft, the depths drilled.

Water was not noted in the borings at the time of the field exploration.

For more detailed descriptions of soils encountered in the drill holes, refer to the boring

DISCUSSION

The proposed plan is to construct a 3-span bridge structure over a proposed relocated haul cane road.

The preliminary grading plan indicates 30-ft cuts and 15-ft fills at the bridge site.

RECOMMENDATIONS

Spread or continuous footings on the decomposed rock are recommended for the proposed overpass structure.

Footing elevations for piers and abutments are recommended to be at about elevations 75 and 90 ft.

Bearing values of about 6000 p.s.f. may be used for footings on decomposed rock. The foundation should be designed as well-reinforced continuous beams to bridge or cantilever over soft spots or voids that may be undetected.

The bottom of footing excavations should be probed for cavities and soft pockets to depths of about 10 ft. The drill holes should be grouted to fill the voids and cement pockets and cavities that may exist. Soft spots or pockets encountered or suspected near the surface of the footing excavations should be exposed and filled with low grade concrete.

To minimize differential settlements between the bridge and the approaches, the backfill at the abutments should be constructed with fairly well-graded granular material. The backfill should be placed in thin level lifts and should be well compacted, if practicable, the approaches to the bridge should be surcharged and paving in these sections delayed until the last phase of construction.

During the compaction process of the backfill, heavy rolling compaction equipment should not operate closer to the wall than a distance equal to about 2/3 the unbalanced height of the fill at any time.

For drainage between the abutment walls and backfill, a 12-in. minimum coarse-grained filter should be used. The filter may be 1-1/2-in. maximum with no more than 5% passing No. 200 sieve. A longitudinal drainage pipe should be provided at the bottom of the filters.

Bridge abutment walls should be designed to resist lateral earth pressures of about 65 p.c.f. equivalent fluid pressure and also the lateral pressures due to vehicular loads.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water or expansive soil pockets may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

Attached are a Boring Location Plan, the boring logs, laboratory test results and limitations.

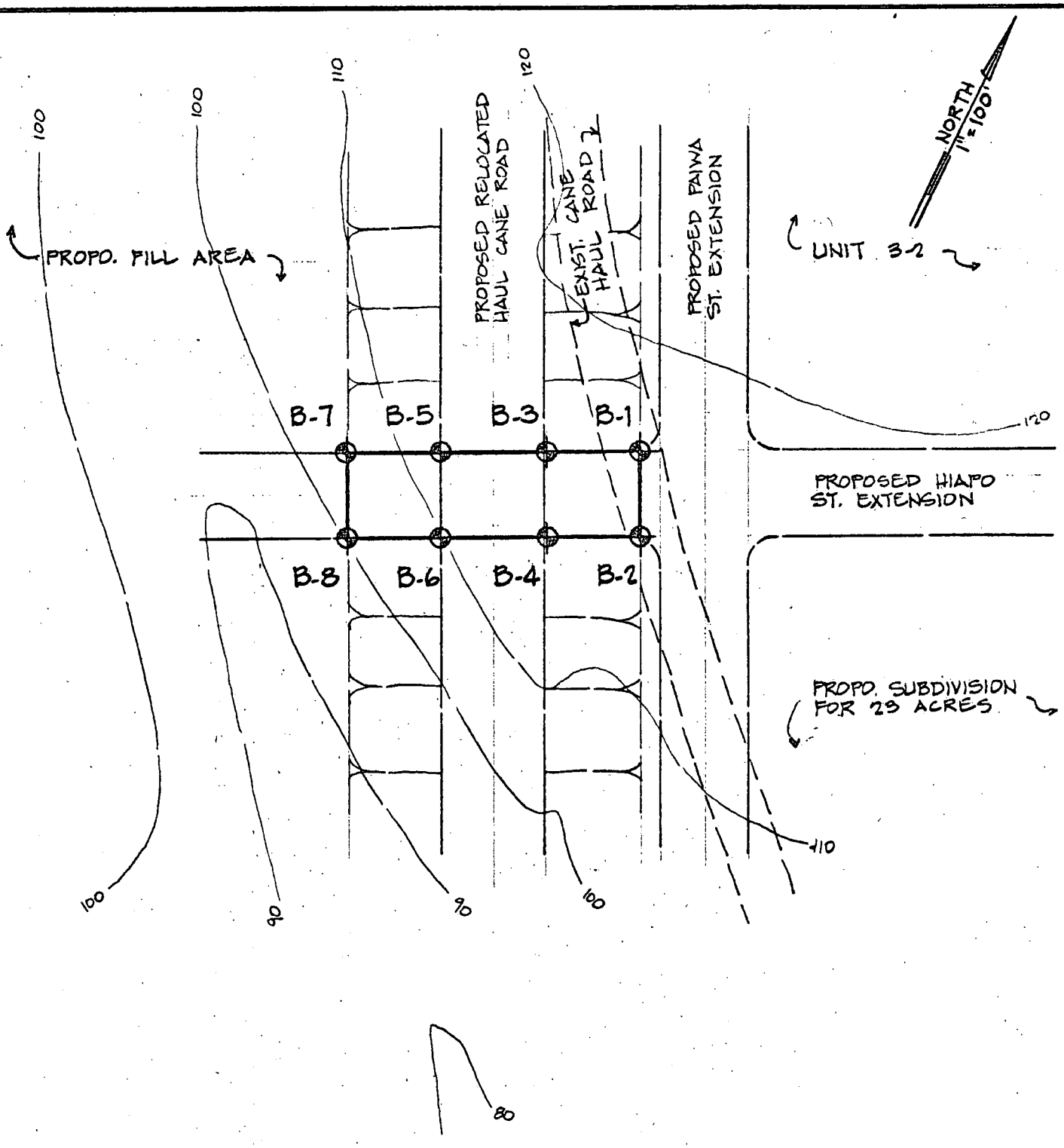
Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf



BORING LOCATION PLAN
PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU WAIKELE, EWA, OAHU, HAWAII

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

FEBRUARY, 1972

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.

WAIPAHU BRIDGE

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
2"S - 2" O.D. THIN WALL TUBE

BORING NO. 6 Sheet No. ____ of ____
Driller W.LUM ASSOC., INC. Date DEC. 21, 22 & 27, 1971
Field Party KAKU, ASATO
Type of Boring AUGER (CONCORE 121B) Diam. 4"
Elev. 105 ± * Datum ____
Drill Bit J.C. DRAG
Water Level NOT NOTICED
Time -
Date 12-21-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 105' ± *?	0	2"S	6-A	-	30	-	6660	-		8/.5' 10/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT	5	2"SS	6-B	39	31	64	-	-		
MH	STIFF, MOTTLED BROWN & GRAY, CLAYEY SILT W/ DECOMPOSED ROCK	10	2"S	6-C	-	36	-	5720	-		5/.5' 9/.5'
	DRILL RATES: 15'-17' - 5 MIN. 17'-18.5' - 20 MIN. 18.5-20' - 5 MIN. MOTTLED BROWN & GRAY DECOMPOSED ROCK	15	2"SS	G-D	-	22	-	-	-		40/.5'
		20	2"SS	G-E	-	21	-	-	-		40/.5'
	DRILL RATE: 20'-23' - 5 MIN. 23'-25' - 30 MIN.	25	2"SS	C-F	-	20	-	-	-		40/.5'
	MOTTLED GRAY DECOMPOSED ROCK W/CLAY POCKETS	30	2"SS	G-G	-	29	-	-	-		50/.5' HAMMER BOUNCES
	MOTTLED GRAY DECOMPOSED ROCK → END OF BORING @ 35.3'	35	2"SS	G-H	-	-	-	-	-		50/.3'

* ELEV. EST. FROM PLAN & PROFILE DATED NOVEMBER, 1971.

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

BORING NO. 7 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date JAN. 3 & 4, 1972

Field Party KAKU, ASATO

Type of Boring AUGER (CONCORE 1218) Diam. 3"

Elev. 95' ± * Datum —

Drill Bit T.C. DRAG

Water Level NOT NOTICED

Time —

Date 1-3-72

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"SS - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER, BLOWS/0.5'
	ELEV. = 95' ± *	0									
ML	MEDIUM, REDDISH BROWN CLAYEY SILT		2"SS	T-A	-	31	-	-	-		
MH	MEDIUM, REDDISH BROWN CLAYEY SILT & DECOMPOSED ROCK	5	2"S	T-B	37	42	54	4310	1550		3/5" 3/5"
	BROWN, DECOMPOSED ROCK	10	2"SS	T-C	-	-	-	-	-		50/1" HAMMER BOUNCES
	DRILL RATE: 10'-11' - 30 MIN.										
	DRILL RATE: 15'-20' - 30 MIN.	15	2"SS	T-D	-	-	-	-	-		50/2" HAMMER BOUNCES
	GRAY & BROWN DECOMPOSED ROCK										
	DRILL RATE: 20'-25' - 30 MIN.	20	2"SS	T-E	-	27	-	-	-		60
	END BORING @ 25.2'	25	2"SS	T-F	-	-	-	-	-		30/2" HAMMER BOUNCES

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

HAMMER: Weight 140# Drop 30"

SAMPLER: 2"SS - 2" O.D. THIN WALL TUBE; 2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 8 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date DEC. 29 & 30, 1971

Field Party KAKU, ASATO

Type of Boring AUGER (CONCORE-1218) Diam. 3"

Elev. 95'± * Datum —

Drill Bit T.C. DRAG & CLAT

Water Level NOT NOTICED

Time —

Date 12-18-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV.: 95'± *2	0									
(ML)	STIFF, REDDISH BROWN CLAYEY SILT		2"SS	8-A	-	31	-	-	-		
		5	2"S	8-B	-	28	-	9000	-		6/.5' 11/.5'
(MH)	STIFF, MOTTLED GRAY & BROWN, CLAYEY SILT & DECOMPOSED ROCK	10	2"SS	8-C	-	39	-	-	-		
	DRILL RATE: 13.5'-15.0' = 7 MIN.										
	MOTTLED GRAY & BLACK DECOMPOSED ROCK W/ CLAY POCKETS	15	2"SS	8-D	-	30	-	-	-		50/.3'
		20	2"SS	8-E	-	17	-	-	-		50/.4'
		25	2"SS	8-F	-	30	-	-	-		50/.3' HAMMER BOUNCES
	GRAY & BROWN DECOMPOSED ROCK	30	2"SS	8-G	-	-	-	-	-		50/.2' HAMMER BOUNCES
		35	2"SS	8-H	-	24	-	-	-		50/.2' HAMMER BOUNCES
	END OF BORING @ 40.1'	40	2"SS	8-I	-	21	-	-	-		50/.1'

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971.

PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	NEAR 3	3	3	
SAMPLE NO.		A	C	
DEPTH BELOW SURFACE	SURFACE	3'-4.5'	15'-16.5'	
DESCRIPTION	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT	
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"	100			
1/2"	100			
#4	99.9			
#10	99.8			
#20	99.6			
#40	99.0			
#100	98.0			
#200	97.3			
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	46	44	51	
Plastic Limit	29	31	34	
Plasticity Index	17	13	17	
Dilatancy	QUICK	MEDIUM	MEDIUM	
Toughness	MEDIUM	MEDIUM	MEDIUM	
Dry Strength	MEDIUM	MEDIUM	MEDIUM	
UNIFIED SOIL CLASSIFICATION	ML	ML	MH	
APPARENT SPECIFIC GRAVITY	2.84			
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	26.0			
Molding Dry Density, P.C.F.	100.9			
Swell upon saturation, %	0.4			
CBR at 0.1" Penetration	10.1			
MOISTURE-DENSITY RELATIONS OF SOILS				
(AASHO T-180-57 Method)	A			
Dry to Wet or Wet to Dry	WET TO DRY			
Max. Dry Density (P.C.F.)	101.8			
Optimum Moisture (%)	24.7			

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 2-4-72 By BT

2-9-72 BT

PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	6	6	7	7
SAMPLE NO.		B		B
DEPTH BELOW SURFACE	SURFACE	5'-6'	SURFACE	5'-6'
DESCRIPTION	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT & DECOMP. ROCK
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	46	64	47	54
Plastic Limit	30	39	31	37
Plasticity Index	16	25	16	17
Dilatancy	QUICK	MEDIUM	QUICK	MED-QUICK
Toughness	MEDIUM	MEDIUM	MEDIUM	MEDIUM
Dry Strength	MEDIUM	MEDIUM	MEDIUM	MEDIUM
UNIFIED SOIL CLASSIFICATION	ML	MH	ML	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	22.7		25.0	
Molding Dry Density, P.C.F.	101.6		100.3	
Swell upon saturation, %	0.6		0.8	
CBR at 0.1" Penetration	29.2		15.8	
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

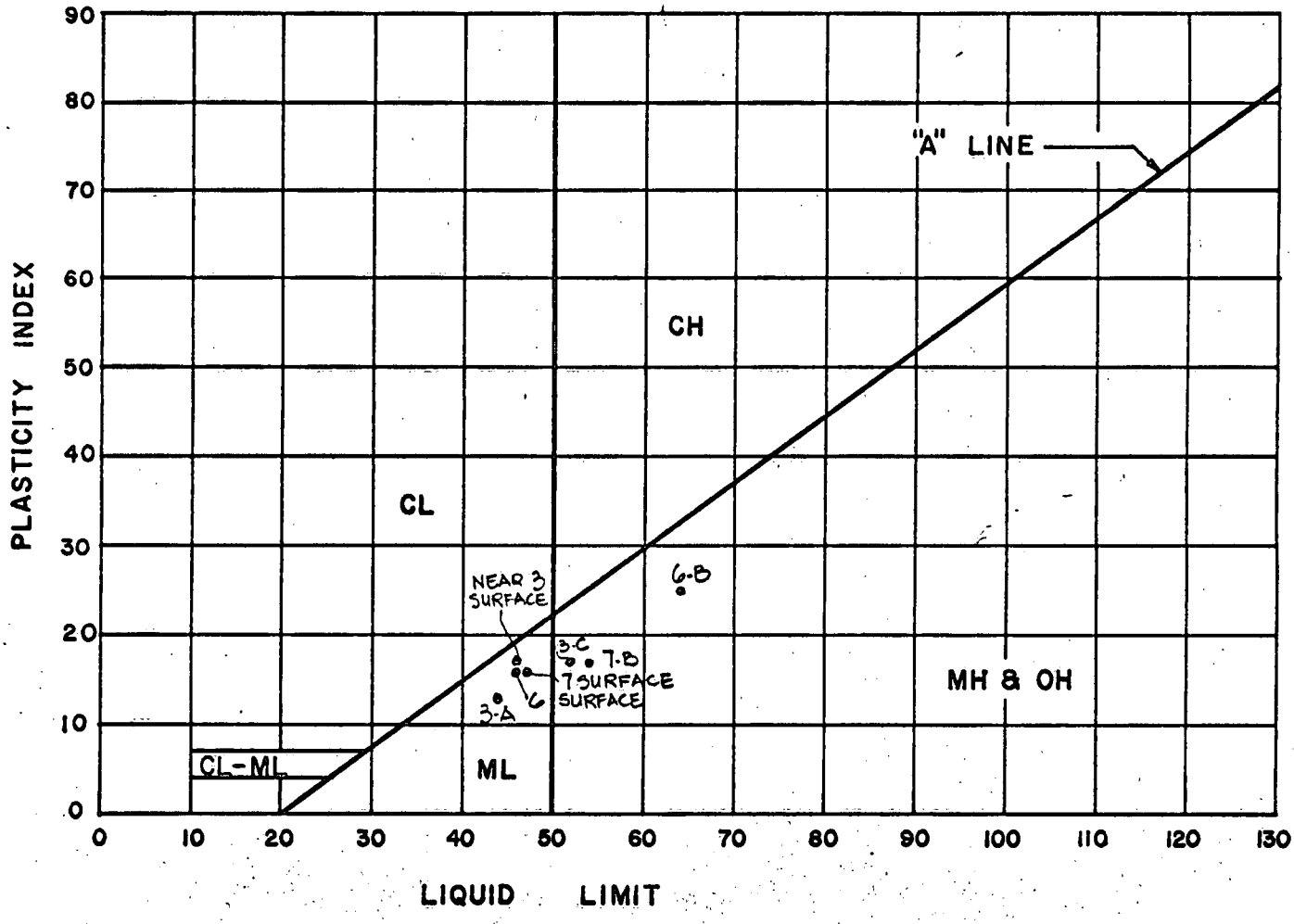
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 2-4-72 By BT

PLASTICITY CHART

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD

LOCATION: WAIKELE, EWA, OAHU, HAWAII



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 2-4-72 BY BT.

MOISTURE-DENSITY CURVE (AASHO T-180-57, METHOD A)

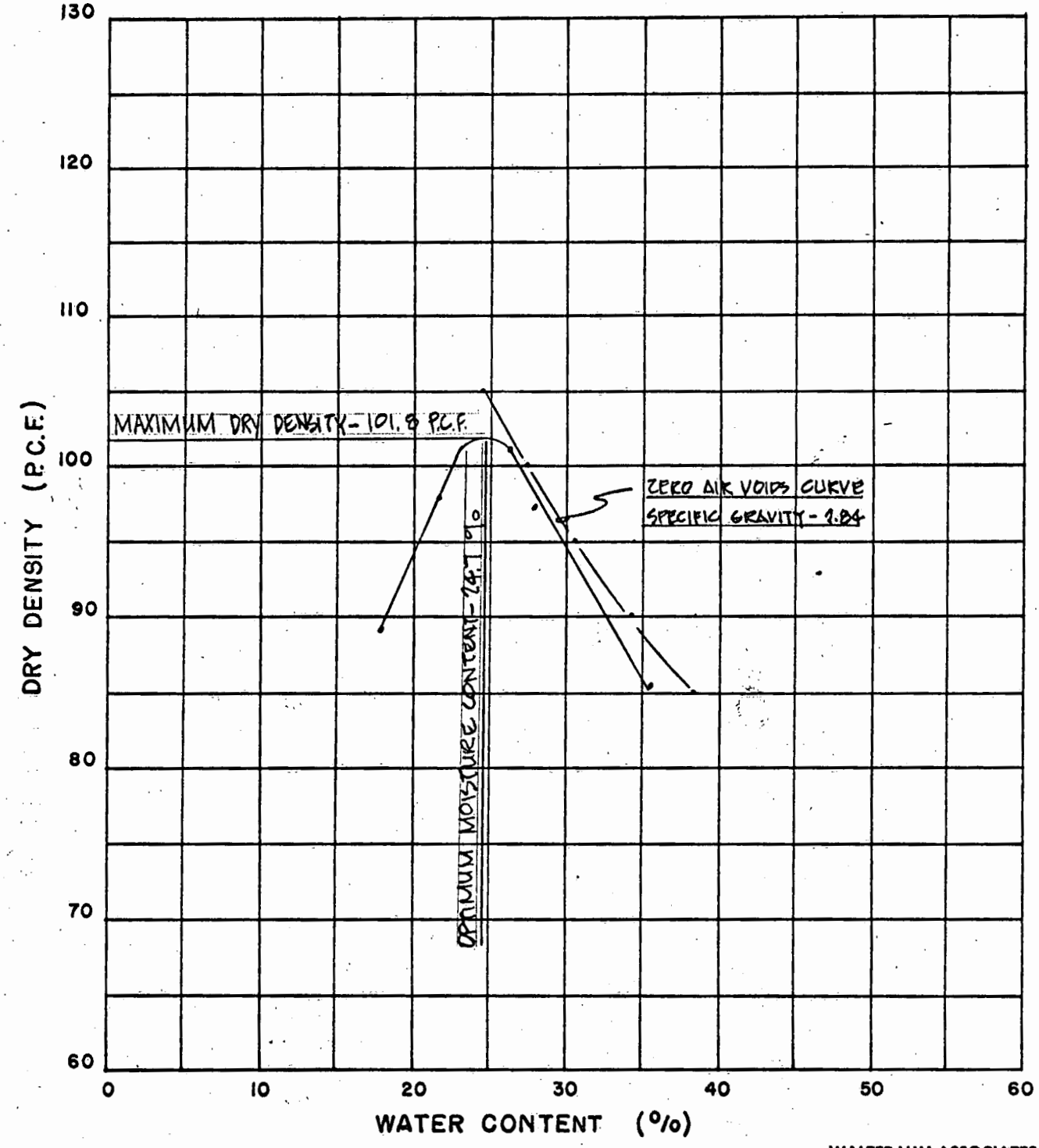
PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD

LOCATION: WAIKELE-EWA, OAHU, HAWAII

SAMPLE NO.: NEAR-3 (SURFACE)

SAMPLE DESCRIPTION: REDDISH BROWN CLAYEY SILT

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4" ϕ 4.59" HIGH
HAMMER: 10 LBS., 18" DROP
LAYERS: 5
BLOWS: 25/LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 1-12-72 BY SK

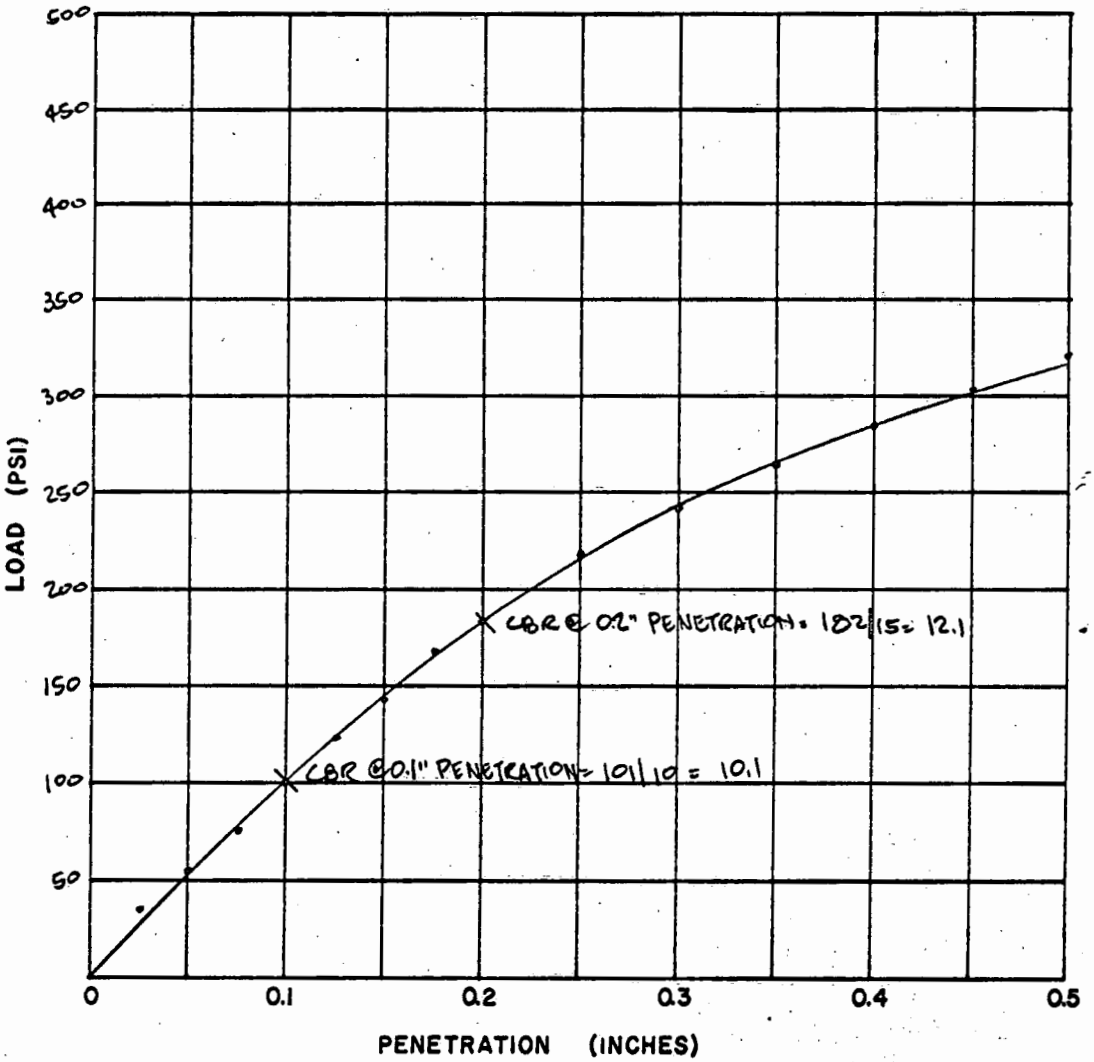
CBR TEST

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD

LOCATION: WAIKELE - EWA , OAHU , HAWAII

SAMPLE NO: NEAR-3 (SURFACE)

SAMPLE DESCRIPTION: REDDISH BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	105	35
0.050	160	53
0.075	225	75
0.100	300	100
0.125	365	122
0.150	425	142
0.175	500	167
0.200	545	182
0.250	650	217
0.300	720	240
0.350	790	263
0.400	850	283
0.450	910	303
0.500	960	320

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 26.0

MOLDING DRY DENSITY, P.C.F. 100.9

CBR @ 0.1" PENETRATION 10.1

DAYS SOAKED 4

DATE 1-11-72 BY MO

DATE 1-17-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

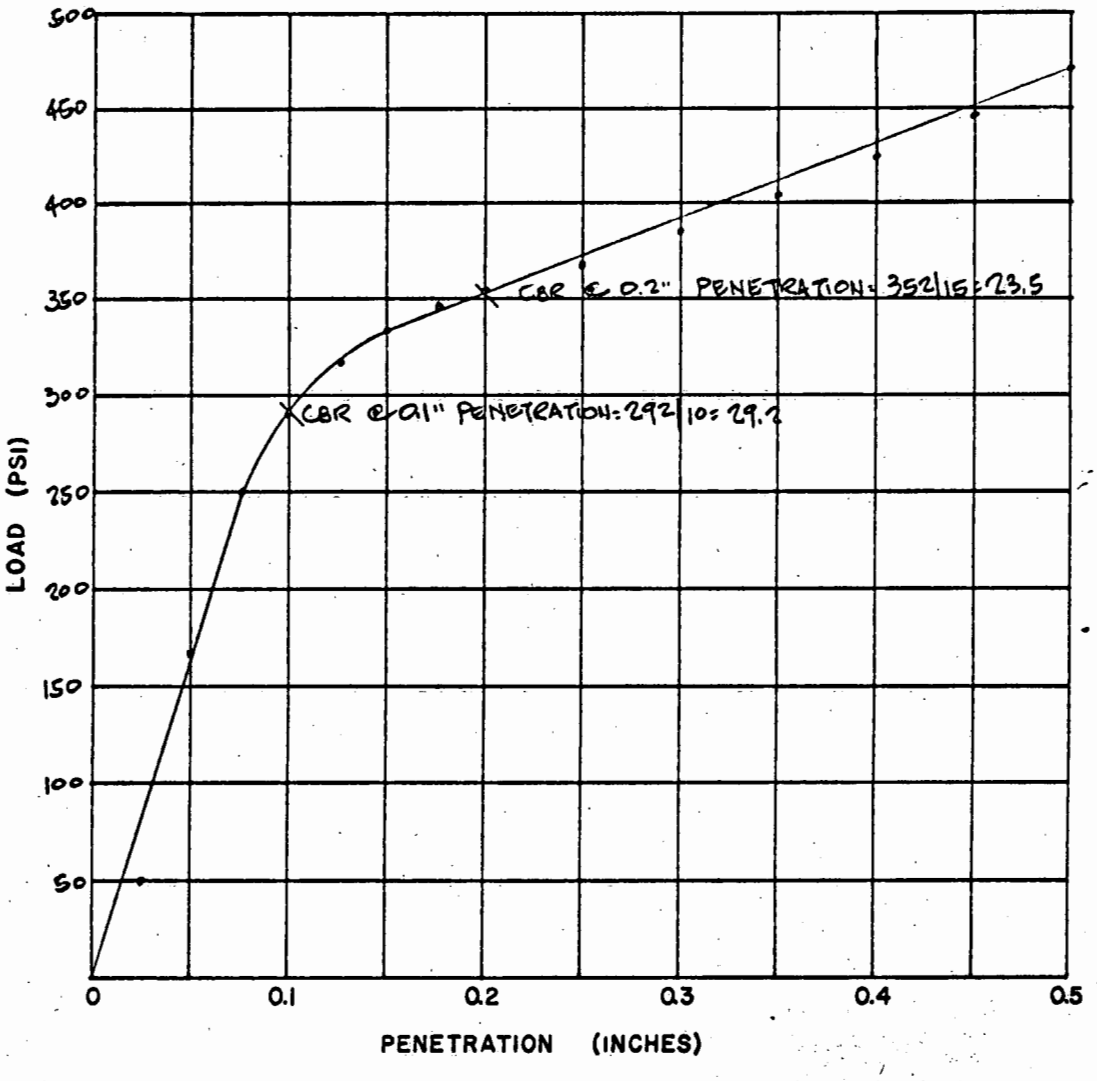
CBR TEST

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD

LOCATION: WAIKELE-EWA, OAHU, HAWAII

SAMPLE NO: 6 (SURFACE)

SAMPLE DESCRIPTION: REDDISH BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	150	50
0.050	500	167
0.075	750	250
0.100	870	290
0.125	950	317
0.150	1000	333
0.175	1040	347
0.200	1060	353
0.250	1100	367
0.300	1150	383
0.350	1210	403
0.400	1270	423
0.450	1340	447
0.500	1410	470

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 22.7

MOLDING DRY DENSITY, P.C.F. 101.6

CBR @ 0.1" PENETRATION 29.2

DAYS SOAKED 4

DATE 1-10-72 BY BC

DATE 1-11-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

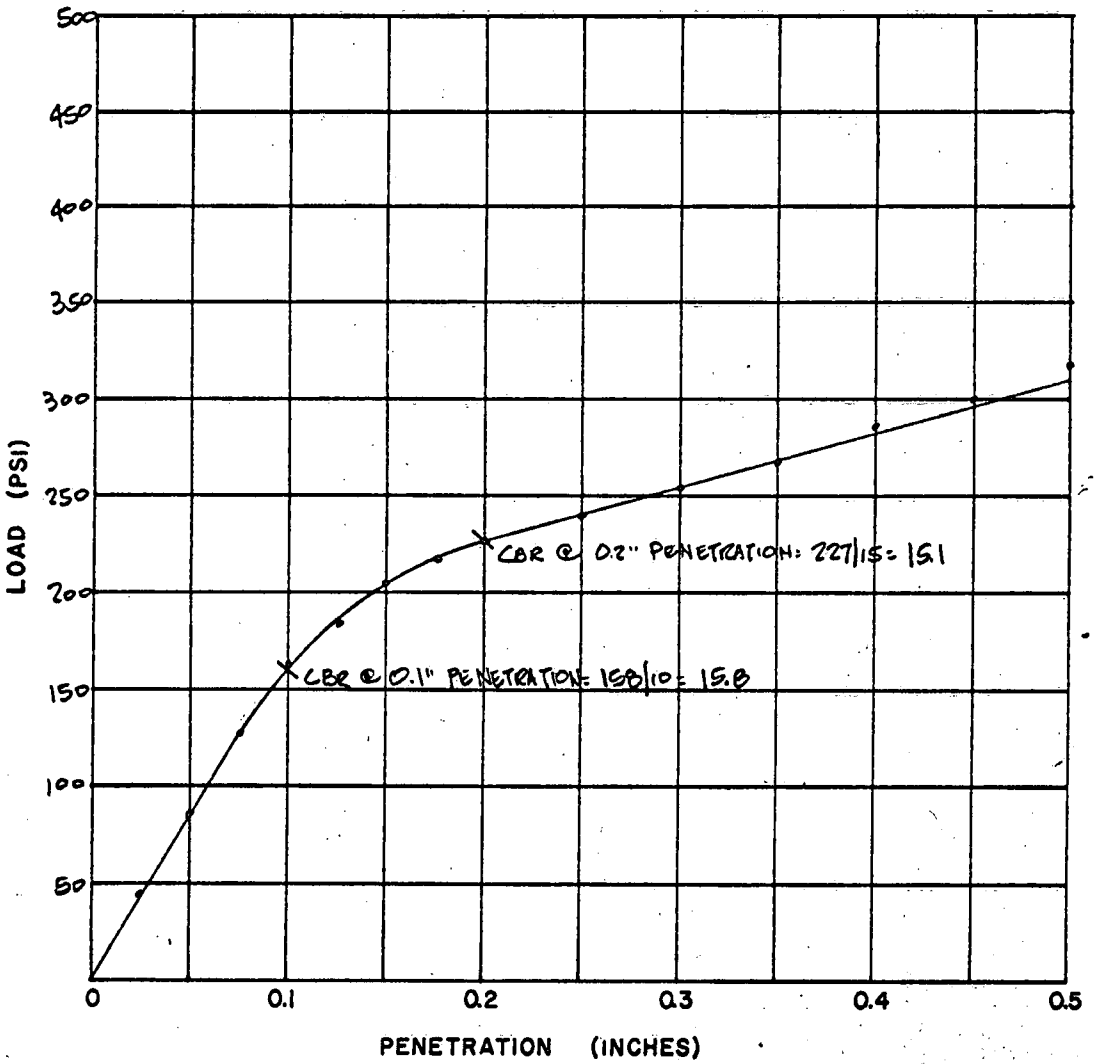
CBR TEST

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HALL CANE ROAD

LOCATION: WAIKELE-EWA, OAHU, HAWAII

SAMPLE NO: 7 (SURFACE)

SAMPLE DESCRIPTION: REDDISH BROWN CLAYEY SILT & DECOMP. ROCK



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	130	43
0.050	255	85
0.075	385	128
0.100	485	162
0.125	550	183
0.150	610	203
0.175	655	218
0.200	680	227
0.250	720	240
0.300	760	253
0.350	800	267
0.400	855	285
0.450	900	300
0.500	955	318

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 25.0

MOLDING DRY DENSITY, P.C.F. 100.3

CBR @ 0.1" PENETRATION 15.8

DAYS SOAKED 4

DATE 1-11-72 BY BC

DATE 1-17-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.

WAIPAHU BRIDGE

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS - 2" O.D. THIN WALL TUBE
2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 4 Sheet No. _____ of _____
Driller W. LUM ASSOC., INC. Date DEC. 20 & 21, 1971
Field Party GLORY, KAKU, COLLURA
Type of Boring AUGER (MOBILE B-30) Diam. 4"
Elev. _____ Datum —
Drill Bit T. C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	12-21-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER, BLOWS/0.5'
(ML)	MEDIUM, REDDISH BROWN SILTY CLAY W/ TRACES OF ROOTS	0	2"S	4-A	-	33	-	2160	-		1/.5' 4/.5'
(ML)	STIFF, REDDISH BROWN CLAYEY SILT	5	2"SS	4-B	-	27	-	-	-		
(MH)	STIFF, BROWN CLAYEY SILT	10	2"S	4-C	-	29	-	8020	-		4/.5' 13/.5'
(MH)	STIFF, REDDISH BROWN SILTY CLAY	15	2"SS	4-D	-	27	-	-	-		
	BROWN & GRAY DECOMPOSED ROCK	20	2"SS	4-E	-	33	-	-	-		50/.4' HAMMER BOUNCES
	COBBLE										
	BROWN & GRAY DECOMPOSED ROCK	25	2"SS	4-F	-	24 28	-	-	-		40/.5' HAMMER BOUNCES
	MOTTLED BROWN DECOMPOSED ROCK	30	2"SS	4-G	-	13	-	-	-		40/.3' HAMMER BOUNCES
	GRAY DECOMPOSED ROCK										
	BOULDER	35	2"SS	4-H		NO RECOVERY					40/.0' HAMMER BOUNCES
	BROWN & GRAY DECOMPOSED ROCK	40	2"SS	4-I	-	23	-	-	-		50/.5' HAMMER BOUNCES
			2"SS	4-J	-	16	-	-	-		50/.2' HAMMER BOUNCES
	DRILL RATE: 45'-49' — 5 MIN. 49'-50' — 5 MIN.										
	COBBLE OR BOULDER										
	END OF BORING @ 50'±		2"SS	4-K		NO RECOVERY					50/.0' HAMMER BOUNCES

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971.

WAIPAHU BRIDGE

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

HAMMER:
Weight 140#
Drop 30"

SAMPLER:
2"S - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON
"BX" - BX DOUBLE TUBE CORE BARREL

BORING NO. 5 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date JAN 4, 5 & 6, 1972

Field Party KAKU, GLORY, COLLURA, ASATO

Type of Boring AUGER ROTARY (CONCORE 121B) Diam. 3"

Elev. 105 ± * Datum —

Drill Bit T.C. DRAG, ROLLER ROCK & T.C. CORING

Water Level	NOT NOTICED				
Time	-				
Date	1-4-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test; 2" O.D. THIN WALL TUBE SAMPLER; N (Blows per foot) 0 10 20 30 40 BLOWS/0.5'
	ELEV. = 105 ± *?									
(ML)	MEDIUM REDDISH-BROWN CLAYEY SILT W/ROOTS		2"SS	S-A	-	24	-	-	-	
	BROWN SILTY CLAY	5								
(ML)	STIFF REDDISH-BROWN CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK		2"S	S-B	-	27	-	5910	-	15/.5'
		10								
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT		2"SS	S-C	-	44	-	-	-	
(MH)	STIFF TANNISH & REDDISH BROWN, CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK	15	2"SS	S-D	-	50	-	-	-	
	MOTTLED BROWN & GRAY SILTY SAND & DECOMPOSED ROCK	20	2"SS	S-E	-	39	-	-	-	26/.5' 50/.4
			"BX"	RUN #1		CORED: 3.6' RECOV: 2.0'				
		25								
		30	2"SS	S-F	-	26	-	-	-	30/.2
	MOTTLED BROWN & GRAY DECOMPOSED ROCK	35	2"SS	S-G	-	34	-	-	-	40/.2
		40	2"SS	S-H	-	36	-	-	-	40/.2
	END OF BORING @ 45.2'	45	2"SS	S-I	-	32	-	-	-	40/.2'

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971